#26 attachment

GR 97 P 2734

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT : Frank Hintermaier
Applic. No. : 09/161,196
Filed : September 25, 1998
Title : Capacitor Having A Barrier Layer Made Of A Transistion Metal Phosphide, Arsenide Or Sulfide
Examiner : Cuong Q. Nguyen
Group Art Unit : 2811

D E C L A R A T I O N under 37 C.F.R. § 1.132

The undersigned Dr. Rainer Bruchhaus hereby declares:

He studied chemistry and mineralogy in Munich, Germany and received his diploma in chemistry and mineralogy in 1980 and 1984, respectively. After receiving his diploma in chemistry, he studied as a postgraduate student in Munich, Germany from 1980 to 1983 and received a Doctorate in chemistry in 1983.

After leaving university he joined the Siemens AG in August 1984 and began working on the development of ceramic varistors in the ceramics department of Corporate Technology in Munich. From 1987 to 1989 he worked in the field of high temperature superconductors in the ceramics department of Siemens Corporate Technology. Since 1989 he has been working in the field of ferroelectric thin films. From 1989 to 1993 this work focused on the deposition of PZT thin films as well as suitable metal electrodes, the patterning of these filme using photolithography and the

electrical characterization of these films in terms of hysteresis loops, leakage current, and ferroelectric switching behavior. Since 1993 managed a 3 years project together with partners from industry as well as university. This project is funded by the German Government for the application of ferroelectric lead zirconate titanate (PZT) thin films in bulk micromachined pyroelectric detector arrays. From 1997 to 2000 he was responsible for a funded project on the application of pyroelectric thin films in infrared detector arrays using CMOS compatible surface micromechanics in cooperation with Osram Optoelectronics and Infineon Technologies, AG as industrial partners. In addition, he worked together with Infineon Technologies AG on the development of barrier layers and bottom electrode materials for capacitor on plug structures. In 2001 he joined Infineon Technologies and is currently delegated to Infineon Technologies Japan K.K. where he is working in the development of high density ferroelectric memory devices in a joint project with Toshiba Corporation in Japan. He is a principal engineer in the integration department responsible for the ferroelectric capacitor module. This long term experience in the field of ferrolectric thin films including electrode as well as barrier materials resulted in invitations to presentations on international conferences. He authored and co-authored more than 20 papers in the field of ferroelectric thin films,

which establishes him as an expert in the relevant field.

The undersigned declares that he has studied the art disclosed in the US-Patent 5,691,219 to Kawakubo et al., and based on the technical expertise of the undersigned declares that the US-Patent 5,691,219 does not disclose a capacitor comprising a barrier layer disposed below a

capacitor dielectric, said barrier layer consisting essentially of a compound formed from a transition element and a material selected from the group consisting of phosphorus, sulfur, and arsenic.

US 5,691,219 describes, with reference to Figures 4A to 4E on column 7, line 35 to 60 of the specification, a memory cell comprising a contact plug 11 formed in an insulating layer 9. The contact plug consists of polysilicon that was deposited by a LPCVD method into a contact hole previously formed in the insulating layer 9. Phosphorous was diffused into the polysilicon deposited in the contact hole thereby decreasing the resistivity of the polysilicon to 10 to 100 Ω/□. After forming a trench in the layers 9 and 10, as shown in Figure 4C, the barrier metal film 12 made of titanium nitride was formed partly on the polishing stop layer 10 and partly on the inner surface of the trench. It is pointed out in US 5,691,219 that the barrier metal layer can also be made of titanium, tantalum or tantalum nitride or the like.

Based on his scientific and work experience, the undersigned is convinced that the concentration of phosphorus atoms used as a dopant for a plug is far too low to create a TiP barrier layer in case only titanium and no additional phosphorus atoms are present. This also applies to the case that the barrier metal layer is made of tantalum. Again, the concentration of phosphorus atoms used as a dopant for a plug is far too low to create a TaP barrier layer in case only tantalum and no additional phosphorus atoms are present.

The undersigned declares that all statements made herein of his own knowledge are true and all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable

by fine or imprisonment, or both, under 18 U.S.C § 1001 and such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name Buchhaus

[Name of the signatory]

Date: 2002-09-30